

## MEMS ACTUATOR FOR PISTON AND TILT MOTION

### ABSTRACT OF THE DISCLOSURE

5       A MEMS device having a spring structure formed by two flexible beams attached  
between a substrate and a movable bar. When non-end sections of the beams are pulled  
in opposite directions, the beam ends attached to the movable bar pull that bar toward the  
substrate, thereby transforming in-plane motion of the non-end sections into out-of-plane  
motion of the movable bar. When the non-end sections are displaced symmetrically, the  
movable bar translates toward the substrate. Alternatively, when the non-end sections are  
10   displaced non-symmetrically, the movable bar rotates with respect to the substrate. In  
one embodiment, each flexible beam is attached to a comb-shaped portion of a motion  
actuator, which has two such portions, each portion interleaved with the other portion and  
adapted to move with respect to the substrate and that other portion. When a voltage  
differential is applied between the portions, they move substantially parallel to the  
15   substrate, thereby deforming the beams and translating/rotating the movable bar.